Hydrologic Model Manager

Short Name	MIKE SWMM
Long Name	
Description	
Model Type	The RUNOFF module of MIKE SWMM is used for event-based and continuous precipitation-runoff simulations, with or without snowmelt and/or subsurface flow. The RUNOFF module is also capable of simulating sediment transport and water quality. Flow routing is performed using linear reservoirs. A separate module, EXTRAN, is also available for more detailed hydraulic routing.
Model Objectives	The RUNOFF module of MIKE SWMM is used to generate runoff hydrographs for analyzing water quality, sediment transport
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Model Structure	SWMM models have been developed for virtually every type of catchment: rural and urban, agricultural and forested, plains and mountains. Typically a single catchment is discretized into smaller subcatchments to better simulate local conditions (land use, soils, slopes, imperviousness, etc.). A hydrograph is specified for each subcatchment. Rainfall excess is computed by subtracting detention storage/interception, infiltration (Horton or Green-Ampt), and evaporation, and by adding snowmelt. Infiltration capacity is recovered during dry periods for continuous simulations. Infiltration may optionally be routed through unsaturated, then saturated zone lumped storage. Groundwater may be lost to channels/pipes, evapotranspiration, and deep groundwater. Snowmelt is modeled using heat budgets and areal depletion curves, and optionally redistribution (to simulate urban plowing). Overland and channel/pipe flow is simulated by non-linear reservoirs (coupled Manning's and continuity equations). Water quality is simulated by buildup and washoff/rating curves of constituents. Street cleaning and catch basins may be simulated in urban environments, and cropping practices may be simulated in agricultural environments. Water quality constituent concentrations may be specified for precipitation.
Interception	
Groundwater	
Snowmelt	
Precipitation	
Evapo-transpiration	
Infiltration	
Model Paramters	(1) Historical or synthetic precipitation record (NWS tapes for continuous simulation). (2) Monthly or daily evaporation rates. (3) Snowmelt: daily max-min (continuous) or time-step (single event) temperatures, monthly wind speeds, melt coefficients, base melt temperatures, snow distribution factors and areal depletion curves (continuous only), other melt parameters. (4) Surface quantity: area, imperviousness, slope, width, depression storage and Manning's coefficient for impervious and pervious areas; Horton and Green-Ampt infiltration parameters. (5) Subsurface quantity: porosity, field capacity,

	wilting point, hydraulic conductivity, initial water table elevation, ET parameters; coefficients for groundwater outflow as function of stage and tail water elevation. (6) Channel/pipe: linkages, shape, slope, length, Manning's roughness, infiltration rate into conduits. (7) Surface quality (some parameters optional depending on methods used): land use; total curb length; catchbasin volume and initial pollutant concentrations; street sweeping interval, efficiency, and availability factor; dry days prior to initial precipitation; dust/dirt and/or pollutant fraction parameters for each land use, or pollutant rating curve coefficients; initial pollutant surface loadings; exponential and power wash-off coefficients; concentrations in precipitation; erosion parameters for Universal Soil Loss Equation (if simulated).
Spatial Scale	(1) Small to large multiple catchments (several thousands of square feet to hundreds or thousands of acres). (2) Lumped simulation of surface flow with allowance for up to 1000 subcatchments and 200 input hyetographs (rain gages), up to 1000 channels/pipes may be simulated by non-linear reservoir routing. (3) Catchment areas may be disaggregated and modeled sequentially for simulation of areas too large for existing SWMM dimensions. (4) Output from RUNOFF module may serve as new input for further simulation by the same or different modules.
Temporal Scale	(1) Single-event or continuous simulation; both modes have an unlimited number of time steps. (2) Precipitation: input at arbitrary time intervals for single-event and continuous simulation (1-15 min. vs. 1 hour); for snowmelt daily max-min temperatures required for continuous, temperatures at arbitrary intervals for single-event. (3) Time step arbitrary for single-event and continuous (typ. 5 min. vs. 1 hour); variable time step available (wet, wet/dry, dry conditions).
Input Requirements	See Model Parameters. Flow routing data is usually obtained from topographic maps, aerial photos, and drainage plans. Input data can be assembled in spread-sheet format (e.g. Microsoft Excel) and imported into MIKE SWMM.
Computer Requirements	Operating system: 32-bit Windows 95/98/NT. Hardware requirements: 486 processor, 16 MB RAM, CD ROM (for program installation).
Model Output	MIKE SWMM can produce two output file types: the standard SWMM output file, and an .mst file, which the user must convert to another format for use in MIKE VIEW, the graphical post-processing program used with MIKE SWMM. For the MIKE VIEW result file, the user specifies the time interval for saving results for presentation.
Parameter Estimatn Model Calibrtn	The SWMM User's Manual provides guidelines for estimating model parameters. Initial estimates for hydrologic data may yield reasonable results, even without calibration, while estimates for concentrations of water quality constituents will at best yield relative changes from one scenario to the next.
Model Testing Verification	As with any model, it is up to the user to ensure that the model is calibrated and verified such that sensible results are returned at the end of the simulation. It is recommended to use separate data sets for model calibration and verification. For RUNOFF, this typically means using separate hyetographs. If performing a water quality simulation, it is extremely important that local calibration data be collected.
Model Sensitivity	Water quality simulations are most sensitive to buildup rates and street cleaning intervals (if any). Washoff coefficients will be more important for continuous simulations. Runoff computations are most sensitive to subcatchment width and percent imperviousness.
Model Reliabiity	SWMM is a public domain model which is widely accepted by the public, regulatory, and consulting sectors for both precipitation-runoff and hydraulic system analyses. With good parameter estimation, the model can predict hydrologic results with reasonable accuracy. Calibration is essential for modeling water quality. Output is repeatable if using the same input file with the same version of the executable code. Slight differences may appear when switching from one version of SWMM to another. These differences are usually the result of improvements to mathematical subroutines.
Model Application	Many studies have been performed for verifying SWMM parameters and include but are not limited to percent imperviousness, detention storage

	(Baltimore, Los Angeles), snowmelt, buildup/washoff (USGS (South Florida), Denver, University of Massachusetts), urban runoff water quality (Seattle; Lancaster, PA), and groundwater flow (Cypress Creek in Pasco County, FL). Please see the SWMM User's Manual for more information.
Documentation	Documentation for MIKE SWMM includes a MIKE SWMM User Manual, as well as on-line help which describes the input data requirements as presented in the SWMM User's Manual. The SWMM User's Manual is a handy reference and is available from other sources. CHI has made a user's manual with SWMM example datasets available for a modest fee. In addition, DHI offers a comprehensive system of technical support through its dedicated Software Support Centre. 24 hour assistance from DHI's highly trained technical staff can be obtained through our Software Support Centre via telephone hotline, fax or the Internet (software@dhigroup.com). As a part of License Service Agreements DHI software users are updated regularly with software developments via newsletters and Internet broadcasts.
Other Comments	MIKE SWMM has been developed as a graphical user interface for pre- and post-processing of hydrologic and hydraulic datasets. The program utilizes the EPA Storm Water Management Model, version 4.4, as its computational core. Currently, the RUNOFF (hydrologic) and EXTRAN (detailed hydraulic) modules of SWMM are supported. While flow routing is not typically performed in RUNOFF simulations, it is possible. The TRANSPORT (water quality and basic hydraulic) module will be supported by the end of 1999. MIKE SWMM is available for download as a demonstration version. Please visit our website at http://www.mikeswmm.com for more information.
Date of Submission	8/10/1999 3:15:13 PM
Developer	
Technical Contact	
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